

AMENDMENTS TO THE CLAIMS

1. (Previously presented) An image encoding method which comprises the step of generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising the step of quantizing the plurality of transformation coefficients for each block by using the same quantization width, wherein the step of quantizing comprises the step of quantizing the transformation coefficient upon setting a dead zone for each block.

2. (Canceled)

3. (Previously presented) An image encoding method according to claim 1, characterized in that the step of quantizing the transformation coefficient upon setting the dead zone comprises the step of setting a dead zone width corresponding to a visual sensitivity for each block.

4. (Previously presented) An image encoding method according to claim 3, characterized in that the step of setting the dead zone width corresponding to the visual sensitivity comprises the step of setting the dead zone width to a larger width for a block with lower visual sensitivity in the spatial domain.

5. (Previously presented) An image encoding method according to claim 3, characterized in that the step of setting the dead zone width corresponding to the visual sensitivity comprises the step of setting a dead zone width larger than a dead zone width with a predetermined quantization characteristic to a block with lower visual sensitivity in the spatial domain.

6. (Previously presented) An image encoding method according to claim 3, characterized in that the step of setting the dead zone width corresponding to the visual sensitivity comprises the steps of analyzing visual sensitivities of a plurality of blocks, and setting the dead zone width to a larger width for a block with lower visual sensitivity of the plurality of blocks.

7. (Previously presented) An image encoding method according to claim 3, characterized in that the step of setting the dead zone width corresponding to the visual sensitivity comprises the steps of analyzing visual sensitivities of a plurality of blocks, and setting a dead zone width larger than a dead zone width with a predetermined quantization characteristic to a block with lower visual sensitivity of the plurality of blocks.

8. (Canceled)

9. (Currently amended) An image encoding method ~~according to claim 8, characterized by further comprising the step of comprising:~~

generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising the step of quantizing the plurality of transformation coefficients for each block upon setting the same quantization width in the plurality of blocks, wherein the step of quantizing comprises the steps of analyzing visual sensitivities of the plurality of blocks, determining the quantization width in accordance with a block exhibiting high visual sensitivity, setting a dead zone width larger than a dead zone width of the block exhibiting high visual sensitivity to a block with lower visual sensitivity, and quantizing the transformation coefficient; and

calculating the dead zone width from at least one of a prediction mode of the image, a direction of intra frame prediction of the image, motion of the image, a direction of inter frame prediction of the image, an average absolute error of the image, a variance of the image, an image range of the image, an average absolute error of a prediction error signal of the image, and a variance of a prediction error signal of the image.

10. (Currently amended) An image encoding method ~~according to claim 8, characterized by further comprising the step of comprising:~~

generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising the step of quantizing the plurality of transformation coefficients for each block upon setting the same quantization width in the plurality of blocks, wherein the step of quantizing comprises the steps of

analyzing visual sensitivities of the plurality of blocks, determining the quantization width in accordance with a block exhibiting high visual sensitivity, setting a dead zone width larger than a dead zone width of the block exhibiting high visual sensitivity to a block with lower visual sensitivity, and quantizing the transformation coefficient; and

calculating the dead zone width from one of a minimum value of an average absolute error of each of a target block and a neighboring block, a minimum value of a variance of the image of each of the target block and the neighboring block, and a minimum value of an image range of the image of each of the target block and the neighboring block.

11. (Previously presented) An image encoding method which comprises the step of generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising the steps of calculating an ideal quantization parameter for encoding an input moving image with preferable image quality, evaluating a relationship between a quantization width corresponding to the ideal quantization parameter, and a quantization width corresponding to a quantization parameter used for encoding output, and quantizing the transformation coefficient upon setting the dead zone width in correspondence with the evaluated relationship.

12. (Currently amended) An image encoding apparatus which comprises:
transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, ~~characterized by comprising; and~~

quantization means for quantizing the plurality of transformation coefficients for each block by using the same quantization width,

wherein said quantization means comprises means for quantizing the transformation coefficient upon setting a dead zone for each block.

13. (Canceled)

14. (Previously presented) An image encoding apparatus according to claim 12, characterized by further comprising dead zone generating means for setting a dead zone width corresponding to a visual sensitivity for each block.

15. (Previously presented) An image encoding apparatus according to claim 14, characterized in that said dead zone generating means comprises dead zone scale generating means for setting the dead zone width to a larger width for a block with lower visual sensitivity in the spatial domain.

16. (Previously presented) An image encoding apparatus according to claim 14, characterized in that said dead zone generating means comprises dead zone scale generating means for setting a dead zone width larger than a dead zone width with a predetermined quantization characteristic to a block with lower visual sensitivity in the spatial domain.

17. (Previously presented) An image encoding apparatus according to claim 14, characterized in that said dead zone generating means comprises dead zone scale generating means for analyzing visual sensitivities of a plurality of blocks, and setting the dead zone width to a larger width for a block with lower visual sensitivity of the plurality of blocks.

18. (Previously presented) An image encoding apparatus according to claim 14, characterized in that said dead zone generating means comprises dead zone scale generating means for analyzing visual sensitivities of a plurality of blocks, and setting a dead zone width larger than a dead zone width with a predetermined quantization characteristic to a block with lower visual sensitivity of the plurality of blocks.

19. (Canceled)

20. (Currently amended) An image encoding apparatus according to claim 19, which comprises transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising quantization means for quantizing the plurality of transformation coefficients for

each block upon setting the same quantization width in the plurality of blocks, wherein said quantization means comprises dead zone generating means for analyzing visual sensitivities of the plurality of blocks, determining the quantization width in accordance with a block exhibiting high visual sensitivity, setting a dead zone width larger than a dead zone width of the block exhibiting high visual sensitivity to a block with lower visual sensitivity, and quantizing the transformation coefficient,

characterized in that said dead zone generating means further comprises dead zone scale generating means for calculating the dead zone width from at least one of a prediction mode of the image, a direction of intra frame prediction of the image, motion of the image, a direction of inter frame prediction of the image, an average absolute error of the image, a variance of the image, an image range of the image, an average absolute error of a prediction error signal of the image, and a variance of a prediction error signal of the image.

21. (Currently amended) An image encoding apparatus according to claim 19, which comprises transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising quantization means for quantizing the plurality of transformation coefficients for each block upon setting the same quantization width in the plurality of blocks, wherein said quantization means comprises dead zone generating means for analyzing visual sensitivities of the plurality of blocks, determining the quantization width in accordance with a block exhibiting high visual sensitivity, setting a dead zone width larger than a dead zone width of the block exhibiting high visual sensitivity to a block with lower visual sensitivity, and quantizing the transformation coefficient,

characterized in that said dead zone generating means further comprises dead zone scale generating means for calculating the dead zone width from one of a minimum value of an average absolute error of each of a target block and a neighboring block, a minimum value of a variance of the image of each of the target block and the neighboring block, and a minimum value of an image range of the image of each of the target block and the neighboring block.

22. (Previously presented) An image encoding apparatus which comprises transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, characterized by comprising quantization control means for calculating an ideal quantization parameter for encoding an input moving image with preferable image quality, dead zone scale generating means for evaluating a relationship between a quantization width corresponding to the ideal quantization parameter, and a quantization width corresponding to a quantization parameter used for encoding output, and quantization means for quantizing the transformation coefficient upon setting the dead zone width in correspondence with the evaluated relationship.

23. (Currently amended) A non-transitory computer-readable medium that causes An ~~image encoding control program characterized by causing~~ a computer to function as transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, quantization means for setting a dead zone for each block, and quantizing the plurality of transformation coefficients for each block by using the same quantization width.

24. (Canceled)

25. (Currently amended) A non-transitory computer-readable medium ~~An image encoding control program~~ according to claim 23, characterized by causing the computer to function as dead zone generating means for setting a dead zone width corresponding to a visual sensitivity for each block.

26. (Currently amended) A non-transitory computer-readable medium ~~An image encoding control program~~ according to claim 25, characterized in that the dead zone generating means comprises dead zone scale generating means for setting the dead zone width to a larger width for a block with lower visual sensitivity in the spatial domain.

27. (Currently amended) A non-transitory computer-readable medium ~~An image encoding control program~~ according to claim 25, characterized in that the dead zone generating means comprises dead zone scale generating means for setting a dead zone width larger than a dead zone width with a predetermined quantization characteristic to a block with lower visual sensitivity in the spatial domain.

28. (Currently amended) A non-transitory computer-readable medium ~~An image encoding control program~~ according to claim 25, characterized in that the dead zone generating means comprises dead zone scale generating means for analyzing visual sensitivities of a plurality of blocks, and setting the dead zone width to a larger width for a block with lower visual sensitivity of the plurality of blocks.

29. (Currently amended) A non-transitory computer-readable medium ~~An image encoding control program~~ according to claim 25, characterized in that the dead zone generating means comprises dead zone scale generating means for analyzing visual sensitivities of a plurality of blocks, and setting a dead zone width larger than a dead zone width with a predetermined quantization characteristic to a block with lower visual sensitivity of the plurality of blocks.

30. (Canceled)

31. (Currently amended) ~~An image encoding control program according to claim 30, A~~ non-transitory computer-readable medium that causes a computer to function as transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, quantization means for setting a dead zone, and quantizing the plurality of transformation coefficients for each block by using the same quantization width, and dead zone generating means for analyzing visual sensitivities of the plurality of blocks, determining the quantization width in accordance with a block exhibiting high visual sensitivity, and setting a dead zone width larger than a dead zone width of the block exhibiting high visual sensitivity to a block with lower visual sensitivity.

characterized in that the dead zone generating means further comprises dead zone scale generating means for calculating the dead zone width from at least one of a prediction mode of the image, a direction of intra frame prediction of the image, motion of the image, a direction of inter frame prediction of the image, an average absolute error of the image, a variance of the image, an image range of the image, an average absolute error of a prediction error signal of the image, and a variance of a prediction error signal of the image.

32. (Currently amended) An image encoding control program according to claim 30, A non-transitory computer-readable medium that causes a computer to function as transformation means for generating a transformation coefficient for each block by transforming an image from a spatial domain into a frequency domain for each block, quantization means for setting a dead zone, and quantizing the plurality of transformation coefficients for each block by using the same quantization width, and dead zone generating means for analyzing visual sensitivities of the plurality of blocks, determining the quantization width in accordance with a block exhibiting high visual sensitivity, and setting a dead zone width larger than a dead zone width of the block exhibiting high visual sensitivity to a block with lower visual sensitivity.

characterized in that the dead zone generating means further comprises dead zone scale generating means for calculating the dead zone width from one of a minimum value of an average absolute error of each of a target block and a neighboring block, a minimum value of a variance of the image of each of the target block and the neighboring block, and a minimum value of an image range of the image of each of the target block and the neighboring block.

33. (Currently amended) A non-transitory computer-readable medium that causes An image encoding control program characterized by causing a computer to function as transformation means for generating a transformation coefficient for each block by transforming an input moving image from a spatial domain into a frequency domain for each block, quantization control means for calculating an ideal quantization parameter for encoding the input moving image with preferable image quality, dead zone scale generating means for evaluating a relationship between a quantization width corresponding to the ideal quantization parameter, and a quantization width corresponding to a quantization parameter used for encoding output, and quantization means for

quantizing the transformation coefficient upon setting the dead zone width in correspondence with the evaluated relationship.